

# Popular Media in the Biology Classroom: Viewing Popular Science Skeptically

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RECOMMENDATION

*Biology is not an opinion subject. ... It's a facts-based subject. If this had been a philosophy class, I wouldn't have said anything.*  
(Spies, 2008)

The above statement was made by a senior in a university embryology course in response to her teacher's suggestion that fetuses should be aborted if amniocentesis showed the presence of trisomy-21. The student, who happened to have a sibling with Down syndrome, was appalled at the comment, and reported the instructor to the Dean of the college because she felt that instructor opinions had no place in the science classroom. In response, the professor (with 35 years of teaching experience) later admitted that he offers this opinion as a means for stimulating class discussion, and if faced with the same situation would not likely find the decision as clear-cut as he might imply in his lecture. Accusations and justifications aside, it is the student's explanation of why this statement was offensive in this particular classroom setting that begs consideration.

Where did the aforementioned lesson go wrong? Why was there a disconnect between the instructor's intent and the student's interpretation? The authors of this article argue that this example elucidates a disturbing trend in students' views of the nature of science (in this case, in the context of biology) as a body of facts. Recent science education research and reform documents strongly disagree with this perspective and stress the need for teaching students to appreciate the nature of the scientific enterprise and its social ramifications.

It can be argued that the responsibilities of biology educators to their students extend far beyond the delivery of science content. Educators are also charged with ensuring that students do not temporarily memorize the information, but actively integrate it into their daily lives. Personal integration of science content should prepare students to evaluate the reliability and merit of this information outside of the classroom (Laugksch, 2000). At the K-12 level, the *National Science Education Standards* support this educational goal as one component of scientific literacy by stating that, "everyone needs to be able to engage intelligently in public discourse and debate about important issues that involve science and technology" (NRC, 1996, p. 1). In addition, the former Executive Director of the National Science Teachers Association (NSTA), Gerry Wheeler, was quoted as saying, "We have in this country a major crisis of people listening to people they feel comfortable with [rather than] listening to a variety of groups and critically thinking through their messages" (MacDonald, 2008).

For the general public, information regarding science topics is often obtained from media sources such as the Internet, television, or newspapers (NSF, 2006). In recognition of this, it would be beneficial for curriculum designers to integrate the critical use of media sources as a tool to promote scientific literacy in the biology classroom (Jarman & McClune, 2007; MacKenzie,

2007). This is admittedly not a new concept to the community of educators, many of whom already address the intersection of science and society by integrating popular media into their lesson plans (Guill, 2006). In his discussion of the primary goals of scientific literacy, DeBoer (2000) argues that the ability to understand and negotiate science issues presented by the media is a critical skill for students' successful matriculation into society.

Teaching through the use of popular media can be difficult for many teachers because science issues presented may often carry implicit or subtle cultural, moral, and/or religious undertones. When asked about their methods regarding teaching such controversial science topics, many teachers indicate a preference for focusing on facts, rationality, balanced views, and teacher neutrality (Oulton et al., 2004). This only reinforces student perceptions that science should be all about "facts." However, teaching from a value-neutral perspective ignores the reality of opinion-based information inherent in the popular media and makes the assumption that student opinions are purely rational. In actuality, science presented in the media is very often not delivered in a neutral manner and can shape students' opinions with its biases.

As educators, one goal is to provide students with the ability to recognize not just *what* information is given (the content), but *how* it is presented (the context). By using and developing teaching models that explicitly address the content as well as contextual factors of media information (Oulton et al., 2004; Seethaler, 2005), we will promote the development of students that possess not only the ability to think critically but to read skeptically as they develop more abstract modes of cognition. The objective is to form high quality attitudes that are "stable, consistent, informed, and connected to abstract principles and values" (Chong & Druckman, 2007a, p. 103).

## Media Framing

To explore this idea further, imagine it is your birthday and you receive gifts from two of your students. One is large and appears professionally wrapped in colorful paper. The other is small and appears hastily wrapped in leftover newspaper.

When viewing these packages, you would naturally make assumptions about their contents that would then sway your perception of and attitude toward the gift-giver as well as your behavior in opening the gift. Would you be surprised then upon opening each package if the gifts inside are identical? Should educators be surprised when they find their students' attitudes and behaviors are affected after being presented with conflictingly "wrapped" statements discussing the same science issue? As seen in the opening example, when the professor framed his instruction by offering a value assessment of the effects of trisomy-21 on a human

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fetus, the quoted student reacted by reaffirming her attitude as to the nature of biology instruction as well as initiating a behavioral response (the student reported the professor to the Dean of the college).

Framing can be defined as a way of packaging complex issues, especially in the popular media, to help the receiver make sense of the topic (Nisbet & Scheufele, 2007). The media packages the same content differently by selecting different words, images, phrases, and presentation styles to focus the receivers on certain aspects of an issue and to help them make sense of its potential complexity (Chong & Druckman, 2007b; Nisbet & Scheufele, 2007). When a communication frame alters the relative weight of certain details over others in an individual's attitude formation, the resulting effect is known as a *framing effect* (Nelson et al., 1997).

In a world where advances in science and technology often proceed at a staggering rate, many issues presented in the media are novel, complicated, and unfamiliar to most people. These topics are what Carmines and Stimson (1980) dub *hard issues*. Various areas in biology might fit this definition, but none so apparently as research in modern biotechnology where discoveries often outpace media coverage.

Within the field of biology, one classical example of issue framing is found in the agricultural production of genetically modified crops (GMCs). The side of the debate worried about the ramifications of GMCs uses terms such as "Frankenfoods" to associate the technology with images of monstrosity and fear. On other side, there are terms such as "Golden Rice" that paint a much more

pleasant picture. The images that these terms conjure go beyond the technical aspects of agricultural biotechnology. These terms are also not meant to stimulate individuals to refer to their own internal understanding of scientific facts but to connect with emotions, values, and attitudes to elicit desired behaviors.

Another recent example has been the public discourse on childhood obesity that has been dubbed an "obesity epidemic." This calls to mind images of contagion and disease, and reinforces images of overweight individuals as outcasts. Other biology-related topics commonly framed in the media are listed in Table 1. It is important to remind readers that many of these topics are inherently controversial, and different levels of student maturity must be considered before addressing them. If interested in finding articles, we suggest typing these terms into news databases (such as [cnn.com](http://cnn.com)) and examining the recent articles that arise.

Media framing can hold influential power over student attitudes. Designing teaching methods that help students recognize frames when receiving information from the popular media can be an important consideration. Arming students with the process skills to identify and negotiate frames they may encounter in their lives will go far in the promotion of scientific literacy. Although the concept of framing has been well discussed in other venues, the audience is typically professionals or the general public and there are few (if any) teacher resources in existence. The following section provides some important considerations for teachers wishing to adopt the idea of frames in the classroom, plus some useful handouts developed from other sources on media frames.

**Table 1. Some common examples of biology issues framed by the media.**

Abortion/Reproductive Rights  
Animal Rights  
Artificial Insemination  
ADD/ADHD  
Body Modification/Tattooing/Piercing  
Cloning/Human Cloning  
Contraception/Birth Control  
Cryogenics  
Donation of Eggs/Sperm  
Eugenics  
Euthanasia/Assisted Suicide/Life Support  
Evolution  
Gene Therapy/Pharmacogenomics  
Genetic Modified Organisms/Genetically Modified Foods  
Global Warming  
Human Enhancement  
Medicinal/Spiritual Drug Use  
Nanomedicine/Nanobiotechnology  
Obesity  
Paternity Testing  
Population Control  
Sexuality/Gender/Transsexuality  
Stem Cell Research  
Test-tube Babies

**Table 2. Some common science frames in the media.**

**MOVING FORWARD:**

- How will science offer a solution to the problems that humans face?
- Look for terms like "solution," "solve our problems," and "quality of life."

**SHOW ME THE MONEY:**

- Who will make or lose money from a particular science product?
- Look for terms like "profit" and "economic competition."

**RIGHT OR WRONG:**

- Where does science sit along the range of right or wrong?
- Look for terms like "moral" and "ethical."

**I JUST DON'T KNOW:**

- What do scientists know and not know about a particular topic?
- Look for terms like "uncertainty," "limits of knowledge," and "sound science."

**PANDORA'S BOX:**

- Will scientific discovery cause some catastrophe?
- Look for terms like "out-of-control," "precaution," and "no turning back."

**POWER PLAY:**

- Who has the power to make decisions about science issues?
- Look for terms like "public/private good" and "abusing power."

**CAN'T WE JUST GET ALONG:**

- Is there some compromise between two sides of a science issue?
- Look for terms like "conflict," "middle way," and "compromise."

**WHO'S WINNING:**

- Who is winning the competition between science debates on particular issues?
- Look for terms like "winner/loser" and "the fight against."

## ○ Teaching Considerations & Tools

It is important to give students resources for identifying common science media frames. Nisbet and Scheufele (2007) have developed a typology of media frames specific to science-related issues. We have developed a handout that can be used to identify these frames in media articles based on this typology with language more accessible to high school and undergraduate students (Table 2). This handout can be distributed along with media articles in order for students to attempt to identify and classify these frames within a particular source.

Selecting a media report for use in the classroom may not be as simple as just perusing a recent newspaper or browsing an Internet news site. Not all science issues are created equal, and their respective framing characteristics can differentially affect a student's attitude. When choosing articles or sources for student use in the classroom, it is important to consider the characteristics of the values that the frame addresses, the relative novelty of the topic, and the perspective that the author chooses to take. Check your local newspapers for stories that might be more applicable to students and help them connect with science as it is discussed in public debates. Once students identify common frames, you can give them the handout, "Reading Science Articles Skeptically." This will start them thinking about the ways that articles can go beyond the pure

"facts" (Table 3 adapted from Briscoe & Aldersey-Williams, 2008). Teachers may want to disseminate these handouts to students with current media articles prior to the class meeting to facilitate an effective discussion.

There are numerous topics in biology discussed in the media that come weighted with heavy cultural and moral values including, but not limited to, stem cell technology, genetic engineering, and evolution. It should come as no surprise that how an individual weighs these values concerning an issue could greatly influence his/her attitude. A higher proportion of value frames to content in an article can further exacerbate attitude polarization (Chong & Druckman, 2007a). As argued earlier, we believe that educators should not shy away from addressing the impact that values have on student attitudes. One practical way to tackle this is to choose articles that use scientific facts as well as value frames, and challenge students to discern these multiple complex components. Instructors could address this by finding articles that deal with the same topic using subtly different frames, allowing students to compare frames and realize how a frame can influence a person's perspective on a topic.

As mentioned earlier, hard issues can be difficult to bridge in science classrooms. Students are especially vulnerable to framing effects when presented with such issues, because they often have greatly reduced availability of information and this varies with age and developmental level (Chong & Druckman, 2007a). To combat framing effects induced by emergent technologies, instructors should help students become familiar with the science behind the issue at hand. When choosing articles, teachers must either provide or make available sufficient content information for students to develop high-quality attitudes despite media frames as well as practice informed decision-making using varying types of information.

The perspective of the frame itself can also have an impact on the attitudes of students. It has been shown that negative frames tend to be more intriguing and to carry more influential power than positive frames. Although the psychological mechanism is still unknown, it seems negative frames tend to be more persuasive because individuals generally consider them more trustworthy (Slovic, 1993). For example, individuals tend to be more influenced by claims that genetic modification of foods is "unnatural" than by claims that it might have a positive effect on human health and world hunger. One way to reduce the impact that negative frames might have on students is to ensure that students are provided with articles that present both a positive and negative perspective of a particular issue.

One area of research that shows promising experimental reduction in framing effects explores the idea of providing individuals with group interactions in which to discuss conflicting

**Table 3. Handout: Reading Science Articles Skeptically.**

### *The Author*

- Who is the author? Who does he/she work for or represent? Why did he/she write this article?

### *The Story*

- Is the whole story being told? If not, why not? Are all the assertions based on a single story? How does the story compare to the statistics or data?

### *The Words*

- Be wary of extreme words like "always," "never," "plague," "inevitable," etc. When these words are used, are they used correctly, or just to make a point?

### *The Data Collectors*

- Who collected the data? Are they credible? Do they have an obvious motive? Who is funding the data collectors?

### *The Sample*

- Is the sample size shown? Is the sample size very small or very large? Is the margin of error shown?

### *The Figures and Graphics*

- What is being compared? What is the figure actually saying? What is the figure missing that might be important?

### *The Timing*

- Why is the story appearing now? Would it be equally newsworthy at another point in time?

### *The Attitude*

- Are we being told there is nothing we can do about an issue? Why then are we being told? Is it merely to alarm the reader? There are often numerous scenarios for a particular situation. Is the one being described only the worst-case scenario? Why?

### *The Big Picture*

- What else is going on in the world at the time? How does this particular science issue compare in scope to others going on right now?



frames. This hypothesis fits nicely with educational theories of social learning and its impacts on student knowledge. A collaborative environment allows individuals to constructively argue with others' attitudes as well as justify and reevaluate their own attitudes toward an issue. Creating competitive classroom environments in which students can discuss competing frames means that a teacher-focused classroom is likely to be less effective than a student-focused classroom. This can be accomplished by placing students in informal groups where they can actively discuss competing frames or by formally involving them in structured classroom debates. We suggest that teachers actively monitor groups so that every student has a chance to participate and no one student monopolizes a position of power. By creating a collaborative classroom environment where issues of social and scientific importance can be openly discussed, instructors can model effective scientific literacy in the community at large. This exercise is similar to other methods of debate used in the classroom, but we extend this theory to not only address science content but also science presentation in the media.

## ○ Summary & Conclusions

We understand that some might view this discussion as an effort to add more unnecessary jargon to the pedagogical language and that, whether explicitly stated or not, most effective teachers understand these concepts inherently. Although we respect this argument, that is not the aim of this discussion. We hope to offer a theoretical perspective on the use of media in the classroom through a lens that is rarely discussed in educational circles but is an on-going discourse in science communication. We believe these types of exercises that are critical to personal and professional development do not "muddy the waters" but instead are small pieces of the scaffolding of further growth as a biology educator.

It is important to help our students realize that although biology (and science) is a "fact-based subject," it is socially embedded in a world of numerous subjective opinions. This is especially obvious when considering controversial media issues with biological themes. The use of popular media in the biology classroom can be a powerful tool for promoting scientific literacy, but what is needed is a comprehensive understanding of the challenges faced by both teachers and students when using these types of sources in the classroom. We hope that teachers will find these considerations useful when using popular media and continue to consider that good science teaching should not just provide content, but help students develop skills to negotiate the world they will face outside of the science classroom. •

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